

3. Coca-Cola has 3 bottling machines. Machine A bottles twice as many bottles as Machine B. Machine C bottles 500 more bottles than Machine A. The three machines bottle a total of 40,000 bottles each day. How many bottles does each machine make each day?

a. Let  $b$  represent machine B.

b. Write an algebraic expression for machine A, using  $b$ .

c. Write an algebraic expression for machine C, using  $b$ .

d. Write and simplify an algebraic expression for their total amount, using  $b$ .

e. Write an algebraic equation that relates the machines to the total bottles. Solve.

f. Determine each machine's amount of bottles.

4. Jill, Bill, and Phil have \$171 together. Jill has three times as much money as Bill. Bill has twice as much money as Phil. How much does each have?

a. Let  $b$  represent Bill's money.

b. Write an algebraic expression for Bill, using  $p$ .

c. Write an algebraic expression for Jill, using  $p$ .

d. Write and simplify an algebraic expression for their total amount of money, using  $p$ .

e. Write an algebraic equation that relates their money to the total. Solve.

f. Determine each person's amount of money.

7. Bill weighs 120 pounds and is gaining ten pounds each month. Phil weighs 150 pounds and is gaining 4 pounds each month. How many months,  $m$ , will it take for Bill to weigh the same as Phil?

$$\begin{array}{r} 120 + 10m = 150 + 4m \\ -120 \quad -120 \\ \hline 10m = 30 + 4m \\ -4m \quad -4m \\ \hline 6m = 30 \\ m = \frac{30}{6} \quad m = 5 \text{ months} \end{array}$$

8. A full 355 mL can of Coke is leaking at a rate of 5 mL per minute into an empty can. How long will it take for the two cans to have the same amount,  $a$ , of Coke?

$$\begin{array}{r} 355 - 5a = 0 \\ 355 = 5a \\ \frac{355}{5} = \frac{5a}{5} \\ 71 = a \\ \boxed{71 \text{ minutes}} \end{array}$$

9. On Saturday, you bowl at Mar Vista Bowl, where renting shoes costs \$2 and each game bowled is \$3.50. On Sunday, you bowl at Pinz where the shoe rental is \$5 and each game bowled is \$3.25. If you spent the same amount each day, how many games,  $g$ , were bowled?

$$\begin{array}{r} 2 + 3.5g = 5 + 3.25g \\ -2 \quad -2 \\ \hline 3.5g = 3 + 3.25g \\ -3.25g \quad -3.25g \\ \hline .25g = 3 \\ \frac{.25g}{.25} = \frac{3}{.25} \quad g = 12 \text{ games} \end{array}$$

10. At one store a trophy costs \$12.50. Engraving costs \$0.40 per letter. At another store, the same trophy costs \$14.75. Engraving costs \$0.25. How many letters,  $e$ , must be engraved for the costs to be the same?

$$\begin{array}{r} 12.50 + .4e = 14.75 + .25e \\ -12.50 \quad -12.50 \\ \hline .4e = 2.25 + .25e \\ -.25e \quad -.25e \\ \hline .15e = 2.25 \\ \frac{.15e}{.15} = \frac{2.25}{.15} \\ e = 15 \text{ letters} \end{array}$$

11. You are seeking to be emancipated from your parents. You are looking for an apartment. There are two final choices. Apartment A has a \$1000 security deposit and costs \$1200 each month. Apartment B has a \$1500 and costs \$1175 each month. How many months,  $m$ , will it take for the costs to be the same?

$$\begin{array}{r} 1000 + 1200m = 1500 + 1175m \\ -1000 \quad -1000 \\ \hline 1200m = 500 + 1175m \\ -1175m \quad -1175m \\ \hline 25m = 500 \\ \frac{25m}{25} = \frac{500}{25} \\ m = 20 \text{ months} \end{array}$$

12. Lenny makes \$55,000 and is getting annual raises of \$2,500. Karl makes \$62,000, with annual raises of \$2,000. How many years,  $y$ , will it take for Lenny and Karl to make the same salary?

$$\begin{array}{r} 5500 + 2500y = 62000 + 2000y \\ -2000y \quad -2000y \\ \hline 5500 + 500y = 62000 \\ -5500 \quad -5500 \\ \hline 500y = 56500 \\ \frac{500y}{500} = \frac{56500}{500} \\ y = 11.3 \end{array}$$

13. In 1987, 34.7 million households owned a dog, and 27.7 million owned a cat. Since then, dog ownership has decreased by 0.025 million households per year, and cat ownership has increased by 0.375 million households per year. How many years,  $y$ , will it take for them to be equal?

$$\begin{array}{r} 34.7 - .025y = 27.7 + .375y \\ -27.7 \quad -27.7 \\ \hline 7 - .025y = .375y \\ +.025y \quad +.025y \\ \hline 7 = .4y \\ \frac{7}{.4} = \frac{.4y}{.4} \\ y = 17.5 \end{array}$$

14. In 2000, Ohio's population was 11.4 million and increasing by 0.5 million each year. Michigan's population was 9.9 million, increasing by 0.6 million each year. When will the two states have the same population? Let  $y$  represent the number of years.

$$\begin{array}{r} 11.4 + .5y = 9.9 + .6y \\ -.5y \quad -.5y \\ \hline 11.4 = 9.9 + .1y \\ -9.9 \quad -9.9 \\ \hline 1.5 = .1y \\ \frac{1.5}{.1} = \frac{.1y}{.1} \\ 15 = y \end{array}$$

7. The PTA needs to raise \$15,000 from its membership. Each membership brings in \$25. If they begin with \$2500, how many memberships will be needed? Let  $m$  represent the number of memberships.

500 members

$$\begin{array}{r} 15000 = 25m + 2500 \\ - 2500 \end{array}$$

$$\begin{array}{r} 12500 = 25m \\ \underline{25} \end{array}$$

9. Homer is trying to gain weight. He currently weighs 232 pounds and will gain four pounds each week on his new diet. How many weeks will it take for Homer to reach 300 pounds? Let  $w$  represent the number of weeks to reach his goal weight?

$$\begin{array}{r} 300 = 4w + 232 \\ - 232 \end{array}$$

$$\begin{array}{r} 68 = 4w \\ \underline{4} \end{array}$$

17 weeks

11. After a day at the Santa Monica Pier, you spent a total of \$35. You spent \$8 on food and the rest on ride tickets at \$2.25 each. How many ride tickets did you buy? Let  $r$  represent the number of ride tickets purchased.

$$\begin{array}{r} 35 = 8 + 2.25r \\ - 8 \end{array}$$

$$\begin{array}{r} 27 = 2.25r \\ \underline{2.25} \end{array}$$

$$12 = r$$

12 rides

13. To mail a first class letter, the cost is \$0.39 for the first ounce and \$0.24 for each additional ounce. If the cost to mail a letter was \$3.03, how many ounces was it? Let  $t$  represent the total weight of the letter.

$$\begin{array}{r} .39 + .25t = 3.03 \\ .39 \end{array}$$

$$\begin{array}{r} .25t = 2.64 \\ \underline{.25} \end{array}$$

t = 10.56 ounces

8. Steve is on a weight loss program. His goal weight is 195 pounds. He currently weighs 339 pounds and plans to lose three pounds each week. How long will it take him to reach his goal? Let  $w$  represent the number of weeks to reach his goal.

$$\begin{array}{r} 339 = 195 + 3w \\ - 195 \end{array}$$

$$\begin{array}{r} 144 = 3w \\ \underline{3} \end{array}$$

48 weeks

10. A deck of cards was dealt out equally to 7 people with 2 remaining cards. How many cards were in the deck originally? Let  $c$  represent the total number of cards.

12. A 355mL can of Coke has a leak in it. The can is leaking 5 mL per minute. How long will it take for the can to have 100 mL remaining? Let  $m$  represent the number of minutes.

$$\begin{array}{r} 355 - 5m = 100 \\ - 355 \end{array}$$

$$\begin{array}{r} - 5m = - 255 \\ \underline{-5} \end{array}$$

$$m = 51$$

51 minutes

14. A hot cup of coffee is 180°F. It loses heat at a rate of 4°F per minute. How long will it take for the coffee to be 70°F? Let  $m$  represent the number of minutes.

$$\begin{array}{r} 70 = 180 - 4m \\ - 180 \end{array}$$

$$\begin{array}{r} - 110 = - 4m \\ \underline{-4} \end{array}$$

27.5 minutes

7.  $5x - 4x + 2 = -3$

$$\begin{array}{r} x + 2 = -3 \\ -2 \quad -2 \end{array}$$

$$\boxed{x = -5}$$

8.  $16 = -2(q + 2)$

$$\begin{array}{r} 16 = -2q - 4 \\ + 4 \quad + 4 \end{array}$$

$$\begin{array}{r} 20 = -2q \\ -2 \quad -2 \end{array}$$

$$\boxed{-10 = q}$$

9.  $-5(2y - 3) = 25$

$$\begin{array}{r} -10y + 15 = 25 \\ -15 \quad -15 \end{array}$$

$$\begin{array}{r} -10y = 10 \\ -10 \quad -10 \end{array}$$

$$\boxed{y = -1}$$

10.  $5 - (3x + 4) = 7$

$$5 - 3x - 4 = 7$$

$$\begin{array}{r} -3x + 1 = 7 \\ -1 \quad -1 \end{array}$$

$$\begin{array}{r} -3x = 6 \\ -3 \quad -3 \end{array}$$

$$\boxed{x = -2}$$

11.  $5 + 3(2x + 6) = 47$

$$5 + 6x + 18 = 47$$

$$\begin{array}{r} 6x + 23 = 47 \\ -23 \quad -23 \end{array}$$

$$\begin{array}{r} 6x = 24 \\ 6 \quad 6 \end{array}$$

$$\boxed{x = 4}$$

12.  $2 - 2(x - 4) = 12$

$$2 - 2x + 8 = 12$$

$$\begin{array}{r} -2x + 10 = 12 \\ -10 \quad -10 \end{array}$$

$$\begin{array}{r} -2x = 2 \\ -2 \quad -2 \end{array}$$

$$\boxed{x = -1}$$